

During the day there was a peculiar arrangement of clouds, indicating the continuance of the aurora; at dusk the auroral light was again visible and continued until 11 p. m., but it was much less brilliant than the display of the early morning.

Wauseon, Ohio: a moderately bright aurora, consisting of streamers reaching an altitude of  $30^{\circ}$ , was observed from 12.30 to 2 a. m. of the 1st.

Bismarck, Dakota: aurora observed from 1.26 a. m. until daylight on the 1st. No beams were visible.

The other displays are as follows:

Fort Macon, North Carolina: a faint auroral display was observed from 11.30 to 11.50 p. m. of the 15th; it appeared above a bank of dark clouds and extended about  $45^{\circ}$  above the horizon. The telegraph lines were slightly affected by the display.

Fremont, Nebraska: dim aurora on the 7th.

Vevay, Indiana, 28th: faint aurora at 8 p. m.

Voluntary observers at Logansport, Indiana, and Embarras, Wisconsin, report auroral displays, on the 8th and 22d, respectively, but the hour at which they were seen and the peculiarities of the displays were not given.

#### THUNDER-STORMS.

Thunder-storms are reported to have occurred in the various districts on the following dates:

*New England.*—2d, 3d, 5th, 6th, 8th to 11th, 14th to 17th, 19th, 20th, 22d to 25th, 27th.

*Middle Atlantic states.*—1st, 2d, 4th to 10th, 12th to 15th, 17th to 21st, 23d to 28th.

*South Atlantic states.*—2d, 3d, 5th to 9th, 11th to 16th, 18th, 19th, 20th, 22d to 29th.

*Florida peninsula.*—5th, 6th, 8th, 10th, 14th to 23d, 25th to 28th.

*Eastern Gulf states.*—2d, 4th, 5th, 8th, 14th, 16th to 27th, 29th.

*Western Gulf states.*—1st to 5th, 7th, 12th to 22d, 24th, 26th, 27th, 29th, 30th, 31st.

*Rio Grande valley.*—2d to 7th, 13th to 17th, 19th to 23d, 25th to 28th.

*Tennessee.*—2d to 6th, 10th to 14th, 19th, 21st to 27th.

*Ohio valley.*—1st, 3d to 7th, 9th to 13th, 15th, 18th, 19th, 22d, 23d, 26th, 27th, 28th.

*Lower lake region.*—1st to 6th, 9th, 10th, 11th, 13th, 15th, 16th, 18th, 19th, 22d, 23d, 26th, 27th.

*Upper lake region.*—1st, 4th to 13th, 15th, 18th, 22d to 26th.

*Extreme northwest.*—4th, 9th, 10th, 17th, 21st, 27th, 30th.

*Upper Mississippi valley.*—1st, 2d, 4th to 13th, 17th to 23d, 25th, 31st.

*Missouri valley.*—1st to 5th, 9th, 11th, 12th, 13th, 15th to 27th, 29th, 30th, 31st.

*Northern slope.*—4th, 6th, 10th, 11th, 12th, 15th, 16th, 18th, 19th, 20th, 23d, 25th to 30th.

*Middle slope.*—1st, 4th, 10th to 17th, 19th to 31st.

*Southern slope.*—1st, 2d, 6th, 7th, 12th, 14th to 21st, 24th to 28th, 30th.

*Southern plateau.*—1st, 2d, 15th, 17th to 21st, 25th, 26th, 27th, 29th, 30th, 31st.

*Middle plateau.*—3d, 8th to 11th, 13th, 14th, 15th, 17th, 19th, 20th, 21st, 23d to 26th, 29th.

*Northern plateau.*—8th, 9th, 13th, 14th, 15th, 24th, 25th, 31st.

*North Pacific coast region.*—3d, 8th to 11th, 13th, 24th, 25th.

*Middle Pacific coast region.*—8th, 10th, 16th to 19th, 30th, 31st.

*South Pacific coast region.*—San Diego, California, 14th, 17th; Cahuenga, California, 15th, 17th.

The following are some of the most important instances of damage by lightning which have occurred during the month.

Dover, Strafford county, New Hampshire: during a violent thunder-storm on the morning of the 9th, several buildings were struck by lightning and burned, entailing a total loss of \$21,000. Numerous instances of damage by lightning were

also reported from various points in New England on the above date.

Fort Worth, Texas: at 2 a. m. of the 21st the cupola on the telephone exchange building was struck by lightning. One hundred and fifty wires connected with the switchboard were melted and the switchboard was ruined.

Philadelphia, Pennsylvania: on the night of the 23-24th, a large oil tank at the Atlantic refinery in the southwestern part of the city was struck by lightning and set on fire. The flames spread rapidly to the other tanks in that vicinity and on the morning of the 24th thirty tanks of oil were burning. The losses resulting from this conflagration are estimated at \$280,000.

Cleveland, Ohio: during a violent thunder-storm on the night of the 23-24th, two tanks of petroleum were struck by lightning and set on fire; loss, \$30,000.

Brownsville, Texas: considerable damage was done to the telephone exchange by lightning on the 27th.

#### ATMOSPHERIC ELECTRICITY INTERRUPTING TELEGRAPHIC COMMUNICATION.

Rio Grande City, Texas, 2d.

Ashland, Oregon, 11th.

Fort Macon, North Carolina, 14th, 26th.

Fort Assinaboine, Montana, 16th, 26th, 27th.

#### OPTICAL PHENOMENA.

##### SOLAR HALOS.

Solar halos were observed in the various districts on the following dates:

*New England.*—4th, 6th, 7th, 19th, 21st, 22d, 26th, 27th.

*Middle Atlantic states.*—2d to 5th, 10th, 13th, 15th, 16th, 19th, 24th, 25th.

*South Atlantic states.*—3d, 4th, 5th, 7th, 8th, 15th, 18th, 21st, 22d, 27th, 28th, 29th, 31st.

*Florida peninsula.*—18th, 29th.

*Eastern Gulf states.*—1st, 3d, 4th, 14th, 15th, 20th, 22d, 25th.

*Western Gulf states.*—2d, 6th, 12th, 14th, 16th, 17th, 19th, 20th, 21st, 23d, 25th, 26th, 28th, 30th, 31st.

*Tennessee.*—1st, 2d, 4th, 14th, 15th, 20th, 22d, 23d, 24th, 26th, 29th, 30th.

*Ohio valley.*—1st, 5th, 17th, 18th, 20th.

*Lower lake region.*—2d, 5th, 10th, 11th, 14th to 17th, 23d, 25th, 27th.

*Upper lake region.*—1st, 3d, 11th, 16th, 17th, 18th, 25th, 26th, 29th, 31st.

*Upper Mississippi valley.*—3d, 5th, 11th, 15th, 17th, 21st, 30th.

*Missouri valley.*—6th, 14th, 17th, 19th, 24th, 28th, 30th.

*Middle slope.*—2d, 4th, 7th, 13th to 18th, 21st, 23d.

*Southern plateau.*—10th, 30th.

*Middle plateau.*—10th, 13th, 28th.

*Northern plateau.*—2d, 4th, 13th, 15th.

*North Pacific coast region.*—2d, 7th, 11th, 12th, 28th, 29th, 30th.

*Middle Pacific coast region.*—1st to 5th, 9th, 11th, 12th, 14th to 17th, 24th, 28th.

*South Pacific coast region.*—3d, 9th, 16th, 21st.

Captain R. B. Quick, commanding the s. s. "Lone Star," reported: "16th, noon, off Alligator Light-house, (N.  $24^{\circ} 50'$ , W.  $80^{\circ} 30'$ ), observed very brilliant solar halo; the circle was about  $20^{\circ}$  in diameter and was more perfect and brighter than any rainbow."

##### LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

*New England.*—1st, 4th 5th, 6th, 8th, 10th.

*Middle Atlantic states.*—1st to 5th.

*South Atlantic states.*—2d, 3d, 4th, 6th, 7th, 8th, 28th, 31st.

*Eastern Gulf states.*—1st, 4th, 5th, 7th, 29th.

*Western Gulf states.*—4th, 6th, 8th to 11th, 15th, 20th, 30th, 31st.

*Tennessee.*—2d, 3d, 4th, 12th, 13th.

*Ohio valley.*—2d to 5th, 8th, 10th, 11th, 12th, 21st.

*Lower lake region.*—3d, 5th.

*Upper lake region.*—1st, 2d, 3d, 5th, 9th.

*Upper Mississippi valley.*—1st, 2d, 4th, 5th, 7th, 8th, 15th, 31st.

*Missouri valley.*—2d to 6th, 8th, 31st.

*Northern slope.*—29th.

*Middle slope.*—2d, 5th, 23d, 29th, 31st.

*Southern plateau.*—3d, 9th.

*Middle plateau.*—1st, 2d, 4th, 5th, 15th, 31st.

*Northern plateau.*—1st, 4th.

*North Pacific coast region.*—1st, 7th, 10th.

*Middle Pacific coast region.*—2d, 3d.

#### MIRAGE.

Milwaukee, Wisconsin: from 4 to 5 p. m. of the 29th, Racine Point, twenty miles south on Lake Michigan, was plainly visible on the horizon.

Mirages were also reported from the following stations:

Duluth, Minnesota, 9th.

Galveston, Texas, 10th.

Webster, Dakota, 15th.

College City, California, 20th, 21st.

Kitty Hawk, North Carolina, 23d.

Indianola, Texas, 28th.

#### MISCELLANEOUS PHENOMENA.

The Signal Service observer at Bismarck, Dakota, reports that at 9 p. m., on the 22d, and again at noon of the 23d, several sharp reports, compared to that of a small pistol, caused by the striking of small fragments of stone against the windows, were generally heard throughout the city. The phenomenon was the source of general comment, the cause of it being unknown until the afternoon of the 23d, when numerous pieces of a flinty substance, supposed to have been of meteoric origin, were collected.

The following note in reference to this phenomenon appeared in one of the Bismarck newspapers of May 23:

For several days the people of the city of Bismarck have been wondering what it was that caused the cracking noise against the windows of the stores and houses. \* \* \* By close observance it was ascertained that the substance which occasionally struck against the glass was a meteoric stone. Small pieces were picked up last evening and were found to be fine fragments of stone.

Observers along the Atlantic coast from Rhode Island to New Jersey, report that on the evening of the 2d, the moon appeared to be of a bright red color. This phenomenon was evidently caused by the smoke from the extensive forest fires which prevailed in New Jersey, New York and Pennsylvania for several days preceding that date.

The following stations report having observed the peculiar appearance of the moon above referred to:

Point Judith, Rhode Island: the atmosphere was filled with smoke from 7.30 to 11.30 p. m. of the 2d, during which time the moon appeared to be of a dull red color.

Narragansett Pier, Rhode Island: from 8 to 11.30 p. m., on the 3d (?), during the prevalence of a light haze, the moon appeared to be of a bright red color.

Philadelphia, Pennsylvania: at about 7 p. m. of the 2d, a dense smoke filled the atmosphere through which the moon appeared to be of a blood-red color.

Barnegat City, New Jersey: on the afternoon of the 2d, the atmosphere was filled with a dense smoke, and at night the moon was of a deep orange color.

#### SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours have been observed at all Signal Service stations. Reports from one hundred and fifty-nine stations show 4,864 observations to have been made, of which three were reported doubtful; of the remainder, 4,861, there were 4,069, or 83.7 per cent., followed by the expected weather.

#### SUN SPOTS.

Professor David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for May, 1884:

Date— May, 1884.	No. of new		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 5 p. m.	0	0	1	101	0	0	3	701	
2, 11 a. m.	1	2	0	51	0	0	4	601	
3, 7 a. m.	1	3	1	51	0	0	4	451	
4, 6 p. m.	0	0	1	2	0	0	3	351	
5, 5 p. m.	1	3	1	5	1	3	3	551	
9, 7 a. m.	3	301	0	0	0	0	6	601	
11, 3 p. m.	2	51	0	0	2	51	8	651	
12, 11 a. m.	0	101	0	3	0	0	8	651	
14, 12 m.	1	3	0	0	1	3	8	501	
15, 10 a. m.	1	2	0	101	1	2	8	401	
16, 10 a. m.	0	0	1	101	0	0	6	251	
17, 6 p. m.	1	3	1	51	1	3	6	201	
18, 10 a. m.	1	1	0	0	1	1	7	251	
19, 11 a. m.	0	0	1	2	0	0	6	251	
20, 3 p. m.	0	0	1	1	0	0	5	201	
21, 1 p. m.	1	2	0	51	0	0	6	201	
22, 11 a. m.	3	101	2	2	3	5	7	301	
23, 3 p. m.	3	201	0	0	2	101	10	501	
24, 11 a. m.	0	0	0	0	0	0	10	501	
25, 3 p. m.	0	0	0	0	0	0	10	451	
26, 11 a. m.	1	101	0	0	0	0	11	551	
27, 10 a. m.	0	201	2	101	0	0	9	651	
29, 9 a. m.	1	1	1	3	1	1	7	601	
30, 5 p. m.	2	51	0	0	2	51	9	601	
31, 12 m.	0	0	1	2	0	0	8	501	

Facule were seen at the time of every observation. †Approximated.

New Haven, Connecticut: at 5 p. m. on the 2d, during the prevalence of a dense haze, the sun was of a dark red color, and on its disc was observed a large spot, resembling the "transit of Venus."

Yuma, Arizona: at 6 p. m. of the 14th a large spot was observed on the sun. A light sand storm was prevailing at that time, and through the sand in the air the spot was distinctly seen. The same spot was also seen on the 3d, appearing like the shadow of a planet; it was apparently moving across the sun from east to west, describing an arc of circle. On the 16th the diameter of the spot was about one-thirtieth that of the sun; on the 17th it was nearing the lower edge of the sun; it was visible on the 18th and 19th, but was not observed after the last named date.

#### EARTHQUAKES.

The following extract is taken from "The New York Maritime Register," of May 21, 1884.

On April 21st, when in N. 21° 06', W. 61° 43', the schooner "M. A. Nutter" was shaken from stem to stern by the shock of an earthquake, apparently from the westward.

The following is taken from the "New York Herald" of May 15th.

CONSTANTINOPLE, May 14, 1884.—An earthquake has occurred in the region south of the sea of Marmora. Some damage was done at Panderma and Erdek, in the province of Broussa. Two slight shocks were felt at Balikesir, but no damage was caused.

#### METEORS.

Captain L. J. Stevens, of the schooner "John Bracewell," reported: May 4th, 2.10 a. m., local time, in N. 42° 28', W. 70° 00', saw a very bright meteor, altitude 45°, bearing ne., course about wnw., ending at nw., altitude about 30°.

Dayton, Washington Territory: at 9.15 p. m. of the 13th, an unusually bright meteor was seen passing in a southerly direction. At its disappearance two bright flashes, occurring in rapid succession, were observed; it left a pale white cloud which floated off in a southerly direction. At 1 a. m. on the 16th, a brilliant meteor passed from near the zenith to the horizon; when about midway between those points it exploded into three parts, all of which disappeared beneath the horizon.

Meteors were also observed at the following places:

Somerville, New Jersey, 1st.

Swanwick, Illinois, 3d.

Prairie du Chien, Wisconsin, 7th, 27th.

Red Willow, Nebraska, 9th.

Milan, Tennessee, 9th.